

APPENDIX 5

Table with 38 columns and 38 rows of numerical data. The columns are labeled 1 through 38 at the top. The rows are labeled 1 through 38 on the left side. The data represents percentages of a table above, with 'BOS' in 1995. The values are integers ranging from 0 to 707.

PRESENT OR TABLE BOOK "COLLECTIVO" IN 1995

1	124	398	52	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
1	124	398	52	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
1	124	398	52	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70

PRESIDENT OF SANGS SLEIP PURPOSE TO BROW IN 1956

Table with 32 columns (numbered 1-32) and 307 rows. The data is organized in a grid format with numerical values. The right side of the table has a column of zeros.

PARENT DO TAKE TRIP PURPOSE "TO SCHOOL" IN 1995

Table with 39 columns (1-39) and 40 rows (1-40). Column 39 is labeled 'TOT'. The data consists of numerical values for each cell.

APPENDIX 8

Appendix 8.1 Population Projections For The Central District And Related Supporting Evaluations and Analyses

Projecting the future population requires care, since the number of the people in the future guides development policy and determines the kinds, timing and quantities of future infrastructure and service expenditures. For those reasons, this Appendix treats the topic at length in seeking a realistic projection of future population.

Theories Applicable methods of population projection, where data permits, include:

- 1) Calculation of average annual percentage of population increase to extend by this multiplier population to the year 2015 in annual increments. This is a simple technique valid only for the short term, perhaps no more than five years. It assumes constant demographic relationships and a continuation of past trends into the future.
- 2) Mathematical curve fitting techniques to extend assumed constant past demographic relationships and trends to the year 2015. Depending on the form of the curve, linear or curvilinear, the annual increment of change can be constant, as with the first technique, or change in a constant way at either an increasing or decreasing rate of change. This method assumes relationships and past trends, whatever their form, are constant into the future.
- 3) Factoring Central District population shares of Honduran population growth from past censuses and projecting those shares by curve fitting to 2015. These projected shares are then applied to projections of national population, in this study, the SECPLAN cohort survival projections from 1988 to 2050 until the year 2015¹. This approach assumes whatever demographic trends and changes—mortality, fecundity, age and sex structure—are taking place nationally have similar relationships locally. In this sense, it is a dynamic technique. It also assumes a constancy in the relationship of national shares, either at a constant or varying rate of change. Migration rates are assumed by the technique in the continuation of national share relationship. Issues of the accuracy of local vital statistics are also subsumed by the assumption of a constant share relationship.
- 4) Cohort Survival is a dynamic technique that adds and removes population on the basis of the age and sex structure, trends in mortality and fecundity, and estimates of net migration. Sensitive to migration effects which not only can change population number but also age and sex structures, it works best at the national level where international reporting requirements, where made, can provide close estimate of net migration changes. The average number of children for each age cohort is determined from vital statistics and multiplied times the number of women in that age cohort to yield the number of children born in the year. Similarly life expectancies are applied to the age-sex distributions to subtract population by deaths. This results in a new age and sex pyramid structure to be used in the following year with newly calculated rates of mortality and fecundity. The technique can trace swells or waves of population created by improvement to population health, abrupt changes in the number of children per mother and the resulting distribution of numbers of persons in

¹ SECPLAN, *Proyecciones de Poblacion de Honduras por Sexo y Edad 1988:2050*, 1992.

age cohorts. The method is best in a stable population, one where changes in mortality fecundity are not rapid and migration is closely recorded. For these reasons it is less reliable in developing countries. Although a model of the actual population change process, it relies on curve fitting techniques to obtain projections of changes in the various population components. The reduction of projection by components, nonetheless, reduces the error of assumed constant relationships assumed by curve fitting.

- 5) Economic projection assumes a population locates and grows on the basis of economic livelihoods. Analysis of the local economy provides a basis for job projections on which population by average household sizes and economic support populations can be added. The technique is limited since the components of an economy are subject to greater external forces and continuity of trends more likely to diminish with time. It can be valid for estimating migration in the short term and superior in this to mathematical methods such as the gravity model (a mathematical analogy to gravity in physics), which takes into account only the numbers of persons and the distances between them over a system of economies, or cities (mass attracts in some proportion to distance).

Applications Honduras had three censuses before the most recent one of 1988, with results as shown in Table 8.1.1.

Table 8.1.1, Population by Census, 1950 To 1988

	1950	1961	1974	1988
Honduras	1,368,605	1,884,765	2,656,948	4,443,721
Central District	99,948	164,941	305,387	539,590
Central District Share	7.3%	8.75%	11.49%	12.14%

These data do show the demographic changes that have taken place in Honduras along with growth. The average household size, along with the number of children per women, is decreasing. In 1974 the average household size was, 5.6 persons. In 1988 it was 4.97, a size projected in the 1975 SECOPT, *Plan Metropolitano del Distrito Central* not to occur until the year 2000. The gross rate of births has fallen from 52 per 1,000 inhabitants in 1945 to 34 pr 1,000 in 1995. Deaths per 1,000 inhabitants have fallen in the same period from 24 to 6. The annual rate of Honduran population growth has remained the about the same, 2.8 per cent a year, since the decline of births and deaths have worked in parallel.

Curve Fitting Six curves were calculated from the data of Table 8.1.1, after interpolation to obtain sufficient data points over periods of 21 years, primarily to obtain a general estimate on which to appraise the results of other techniques. More than one curve was computed to determine the best curve fit to the data. The computation of a number of curve forms also makes assumptions about the nature of past trends explicit, as shown in Table 8.1.2 for each curve computed. Table 8.1.2 also shows the elements on which tests for the "goodness of fit" were applied to each curve.

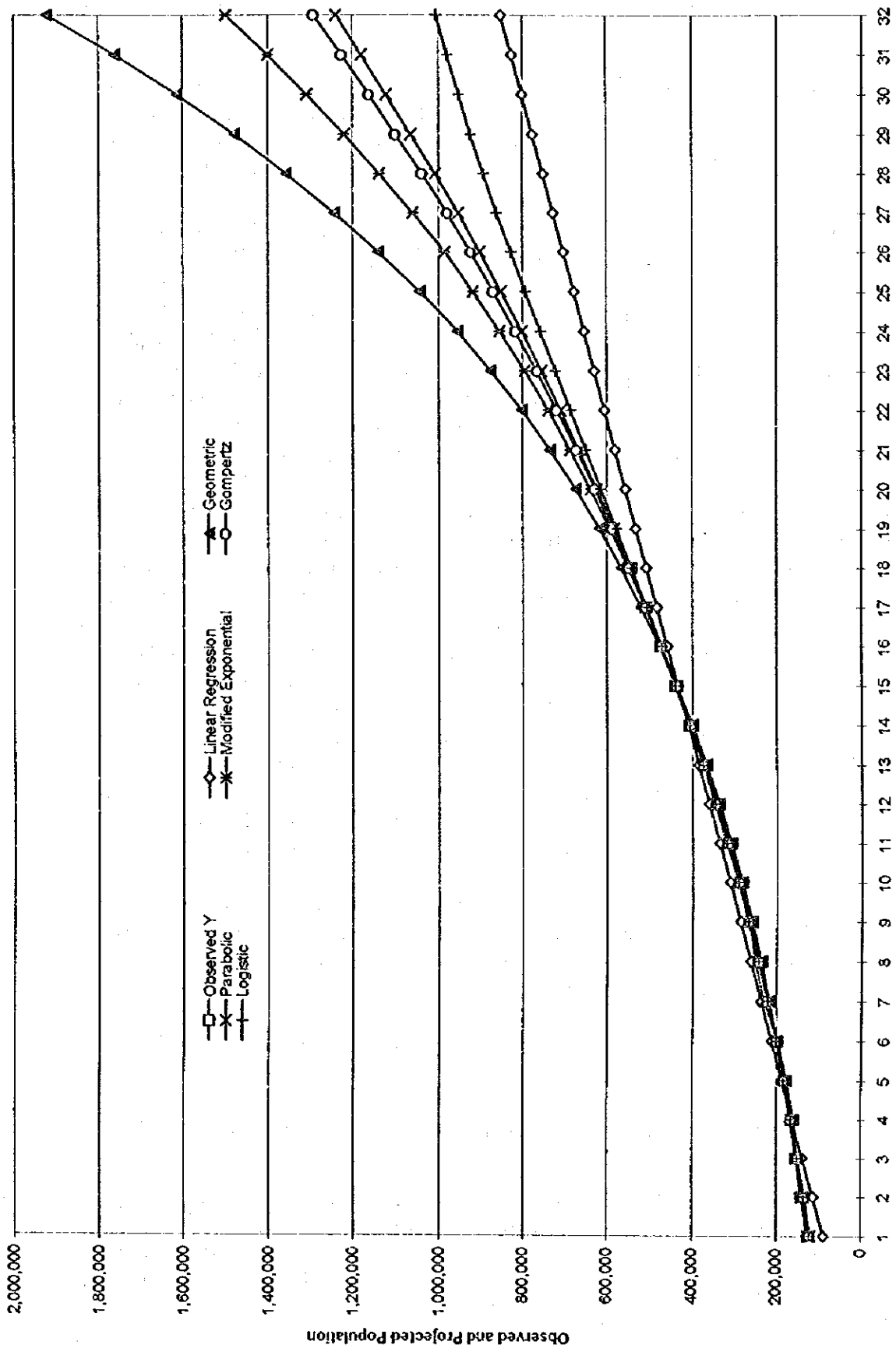
Table 8.1.2 Computed Curves for Population Projection, Underlying Assumptions, and Related Test Statistics

Mathematical Curve	Assumptions	Test Statistic
Linear	Constant growth increments	First differences
Geometric	Constant growth rate	First differences of logarithms
Parabolic	Constant rate of change	Second differences
Modified Exponential	Constant ratio of growth increments	Ratio of successive first differences
Gompertz	Constant ratio of logarithms of growth increments	Ratio of first differences of logarithms
Logistic	Constant ratio of reciprocals of growth increments (usually associated with growth phenomena of an S curve form)	Ratio of differences between reciprocals

Various tests for goodness of fit were applied. The coefficient of relative variation measured the fit of past data. Sums of squared deviations, mean errors, and mean absolute percentage errors were calculated to determine the best fit overall or as projected. The smaller the value of all of these measures, the closer the fit of calculated data to observed data. The geometric curve, since it has a constant growth rate, provides an estimate of the average annual rate of increase, although based upon a known equation. The results of these curve fits are shown in Table 8.1.3 and Fig. 8.1.1. The geometric curve proved the best fit and has an annual rate of increase of 4.56 per cent. This effectively

Table 8.1.3 Six Curve Fits, Central District Population 1954-2015

Year	Observed Y	Linear Regression	Geometric	Parabolic	Modified Exponential	Gompertz	Logistic	Geometric Curve Details
1954	123,582	88,821	128,305	125,513	119,225	121,046	122,194	Mean Error = -368,5154852
1956	141,307	113,384	140,010	137,126	133,534	134,615	135,354	Mean Absolute % Error = 2.32%
1958	153,124	137,946	152,782	150,357	148,801	149,336	149,750	Sum of Squared Deviations = 1521310348
1960	159,033	162,509	166,720	165,207	165,091	165,268	165,457	Coefficient of Relative Variation = 33.68
1962	175,745	187,072	181,929	181,676	182,473	182,468	182,548	This curve increases without limit at 4.56% a year
1964	197,352	211,635	198,525	199,764	201,019	200,996	201,088	
1966	229,762	236,198	216,636	219,471	220,808	220,908	221,135	
1968	251,369	260,761	236,399	240,796	241,922	242,259	242,734	
1970	262,173	285,324	257,964	263,740	264,450	265,105	265,919	
1972	283,780	309,887	281,497	288,303	288,488	289,499	290,702	
1974	305,387	334,450	307,177	314,485	314,136	315,490	317,080	Yc = a * b ^x
1976	338,836	359,013	335,199	342,285	341,503	343,129	345,024	Yc = 269473.7 * 1.044617^x
1978	372,285	383,575	365,777	371,704	370,702	372,461	374,482	Equation above reads " Y computed equals a times b to the x power." X is the index value for the period. A geometric curve assumes a constant rate of change and fixed conditions creating change.
1980	405,734	408,138	399,146	402,742	401,858	403,531	405,375	
1982	439,183	432,701	435,558	435,399	435,101	436,379	437,598	
1984	472,632	457,264	475,292	469,675	470,570	471,042	471,017	
1986	506,081	481,827	518,650	505,569	508,416	507,557	505,474	
1988	539,530	506,390	565,964	543,082	548,798	545,953	540,785	
1990		530,953	617,595	582,214	591,884	586,260	576,748	
1992		555,516	673,935	622,964	637,857	628,500	613,143	
1994		580,079	735,415	665,334	686,909	672,696	649,741	
1996		604,641	802,503	709,322	739,248	718,862	686,305	
1998		629,204	875,712	754,929	795,093	767,012	722,603	
2000		653,767	955,599	802,155	854,679	817,155	758,405	
2002		678,330	1,042,774	850,999	918,256	869,295	793,497	
2004		702,893	1,137,901	901,462	986,093	923,434	827,681	1995 Tegucigalpa Population = 768,959
2006		727,456	1,241,706	953,544	1,058,474	979,567	860,781	2015 Tegucigalpa Population = 1,840,973
2008		752,019	1,354,981	1,007,245	1,135,704	1,037,687	892,644	
2010		776,582	1,478,590	1,062,565	1,218,108	1,097,785	923,146	
2012		801,145	1,613,475	1,119,503	1,306,032	1,159,844	952,188	
2014		825,707	1,760,665	1,178,060	1,399,846	1,223,845	979,698	
2016		850,270	1,921,282	1,238,236	1,499,945	1,289,766	1,005,632	



Year: 1 = 1954; 18 = 1988; 32 = 2016

Fig. 8.1.1 Tegucigalpa Population 1954-2016 by Six Curves: Geometric Best Fit

assumes, if continued in the future, a constant household size and rate of migration or a falling household size and increased migration. The first assumption is as unlikely as the second. Average household sizes have been diminishing and there are limits, as reasoned in Appendix 7.2, to Central District resources and economic growth, such that past rates of migration can not continue and must decrease. The economy is maturing and spatially diversifying. Other urban centers are developing at a faster rate than the Central District and attracting migrants with an increasing number of jobs (see Building Permits, below).

Central District Projected Share of National Cohort Survival Projections Table 8.1.4 shows computations and results of the Central District share of the national population method for each of the observed and projected years. As with the curve fitting procedures, this data was interpolated to provide sufficient data points for computation. The projected shares were multiplied for year by projections of Honduran population made in SECPLAN, *Proyecciones de Poblacion de Honduras por Sexo y Edad 1988-2050* to obtain projections for the Central District to the year 2015. The logistic curve was the best fitting curve among the six computed and was used in the projection. The logistic curve has the form, $Y_c = 1 / (c + a * b^x)$, with the values $Y_c = 1 / (7.97032 + 5.48245 * 0.83096^x)$. The mean deviation equaled -0.00013; the mean absolute error, 1.698 per cent; sum of squared deviations, 0.00008; and the coefficient of relative variation, 38.32. This curve has an upper limit of 10.1254. The population for 2015 is almost twice the Tegucigalpa population of 1988, or 1.9 times as much. As the table shows, the logistic curve underestimates in the early observed years and begins to over estimate in the later observed years. This projection is superior to that of the geometric curve projections, nonetheless, since it accounts for national demographic changes contained in the national cohort survival projections. That the logistic curve was the best fit for the shares is appropriate in that curves used in the national cohort survival projection for fecundity fit a logistic curve and the form of the curve follows an S pattern of growth of rapid increase in the early years and a slowing of growth in later years.

Fig. 8.1.2 graphs the SECPLAN population projection for Honduras, the logistic share projection for the Central District, and the Logistic share projection (again the best of six) of the Central District economically active population. The graph is shown semi-logarithmically to enable quick appraisal of the different rates of change. Honduras and the Central District show curves of decreasing rates of increase. The economically active population shows an increasing rate of increase expected with an aging population—one with fewer people below the age of 14—consistent with a national trend.

Table 8.1.4 Projected Share Cohort Survival Method, Logistic Curve Best Shares Fit

Year	Honduras Population (SECPLAN)	Tegucigalpa Population	Observed Share	Logistic Share	Honduras Population	Tegucigalpa Projected Population
	(1)	(2)	= (2) / (1)	(3)	(4)	= (3) * (4)
1950	1,388,605	99,948	0.07303			
1951	1,415,529	105,856	0.07478			
1952	1,462,452	111,765	0.07642			
1953	1,509,376	117,673	0.07796			
1954	1,556,300	123,582	0.07941	0.0743	1,556,300	115,686

Year	Honduras Population (SECPLAN)	Tegucigalpa Population	Observed Share	Logistic Share	Honduras Population	Tegucigalpa Projected Population
	(1)	(2)	= (2) / (1)	(3)	(4)	= (3) * (4)
1955	1,603,223	129,490	0.08077	0.0771	1,603,223	123,583
1956	1,650,147	135,399	0.08205	0.0798	1,650,147	131,737
1957	1,697,070	141,307	0.08327	0.0824	1,697,070	139,921
1958	1,743,994	147,216	0.08441	0.0851	1,743,994	148,350
1959	1,790,918	153,124	0.08550	0.0875	1,790,918	156,726
1960	1,837,841	159,033	0.08653	0.0900	1,837,841	165,332
1961	1,884,765	164,941	0.08751	0.0922	1,884,765	173,813
1962	1,944,164	175,745	0.09040	0.0945	1,944,164	183,684
1963	2,003,562	186,548	0.09311	0.0965	2,003,562	193,419
1964	2,062,961	197,352	0.09566	0.0986	2,062,961	203,399
1965	2,122,360	208,155	0.09808	0.1004	2,122,360	213,186
1966	2,181,758	218,959	0.10036	0.1023	2,181,758	223,192
1967	2,241,157	229,762	0.10252	0.1039	2,241,157	232,961
1968	2,300,556	240,566	0.10457	0.1056	2,300,556	242,927
1969	2,359,955	251,369	0.10651	0.1070	2,359,955	252,627
1970	2,419,353	262,173	0.10836	0.1085	2,419,353	262,499
1971	2,478,752	272,976	0.11013	0.1098	2,478,752	272,089
1972	2,538,151	283,780	0.11181	0.1110	2,538,151	281,830
1973	2,597,549	294,583	0.11341	0.1121	2,597,549	291,285
1974	2,656,948	305,387	0.11494	0.1132	2,656,948	300,870
1975	2,784,575	322,112	0.11568	0.1142	2,784,575	317,963
1976	2,912,201	338,836	0.11635	0.1151	2,912,201	335,298
1977	3,039,828	355,561	0.11697	0.1159	3,039,828	352,462
1978	3,167,455	372,285	0.11753	0.1168	3,167,455	369,834
1979	3,295,081	389,010	0.11806	0.1175	3,295,081	387,018
1980	3,422,708	405,734	0.11854	0.1181	3,422,708	404,380
1981	3,550,335	422,459	0.11899	0.1187	3,550,335	421,547
1982	3,677,961	439,183	0.11941	0.1193	3,677,961	438,865
1983	3,805,588	455,908	0.11980	0.1198	3,805,588	455,988
1984	3,933,214	472,632	0.12016	0.1203	3,933,214	473,239
1985	4,060,841	489,357	0.12051	0.1207	4,060,841	490,300
1986	4,188,468	506,081	0.12083	0.1212	4,188,468	507,469
1987	4,316,094	522,806	0.12113	0.1215	4,316,094	524,458
1988	4,443,721	539,530	0.12141	0.1219	4,443,721	541,538
1989				0.1222	4,607,924	562,917
1990				0.1225	4,744,540	581,015
1991				0.1227	4,885,493	599,493
1992				0.1230	5,028,969	618,350
1993				0.1232	5,173,141	637,156
1994				0.1234	5,317,831	656,085
1995				0.1235	5,462,795	674,922
1996				0.1237	5,608,275	693,873
1997				0.1239	5,754,542	712,807
1998				0.1240	5,901,239	731,838
1999				0.1241	6,048,156	750,792
2000				0.1243	6,194,926	769,764
2001				0.1244	6,341,717	788,646
2002				0.1245	6,488,792	807,594
2003				0.1245	6,635,533	826,417

Year	Honduras Population (SECPLAN) (1)	Tegucigalpa Population (2)	Observed Share = (2) / (1)	Logistic Share (3)	Honduras Population (4)	Tegucigalpa Projected Population = (3) * (4)
2004				0.1246	6,781,849	845,213
2005				0.1247	6,927,291	863,826
2006				0.1248	7,072,313	882,408
2007				0.1248	7,217,359	900,928
2008				0.1249	7,362,066	919,423
2009				0.1249	7,506,058	937,771
2010				0.1250	7,648,997	956,002
2011				0.1250	7,790,739	974,034
2012				0.1251	7,932,480	992,077
2013				0.1251	8,074,222	1,010,076
2014				0.1251	8,215,963	1,028,085
2015				0.1252	8,357,705	1,046,385

Cohort Survival and Economic Projection A cohort survival projection for the central district was not attempted because of insufficient vital statistics and migration data. This study did not use similar cohort survival projections made by SECPLAN alone for the Central District, since, although the mechanics of computer computation are easy, the technique works best for large populations, developed countries, and stable demographic conditions. Developing countries do not have stable populations; changes in fecundity, and especially mortality, are rapid. Current survival rates, for example, typically underestimate the surviving population. With smaller populations, slight deviations year to year in the number of women having babies distort the children to women ratios and slight changes in the local economy and resulting shifts in migration distort net migration ratios.

Below the national level, where net migration estimates are less controlled, the technique is especially prone to error. Changes in the stock of residential buildings and industrial investment can create error in projection even in a short period of time. Additionally, the SECPLAN projections for the Central District produce large discontinuities in trend in a brief period of time. The rate of population increase jumped from 3.4 per cent in 1988 to 11 and 10 per cent in 1989 and 1990 while building permit data showed trend declines for residential and industrial permits. These early year distortions overestimate the population in later years of the projections, although the SECPLAN projections resume a growth rate for the years 1991 to 1995 of 3.5 to 3.06 per cent., and the reasons stated in Chapter 7. For similar limitations of the data, an economic projection was not attempted and because the projections would be stable for only the short term. (See Appendix 7.2, projections workers by a limited number of the types of economic activity are possible, if the assumption of a constant base multiplier is tenable.)

Evaluation of Existing Projections Tables 8.1.5 and 8.1.6 list and evaluate other population projections for the Central District. The 1993 projection by SECPLAN uses a cohort survival method. These projections were not used in this study as they were believed too high, had too great a population discontinuity for the years 1989 and 1990, and were built on assumptions of migration and fecundity that appeared, upon analysis, in error.

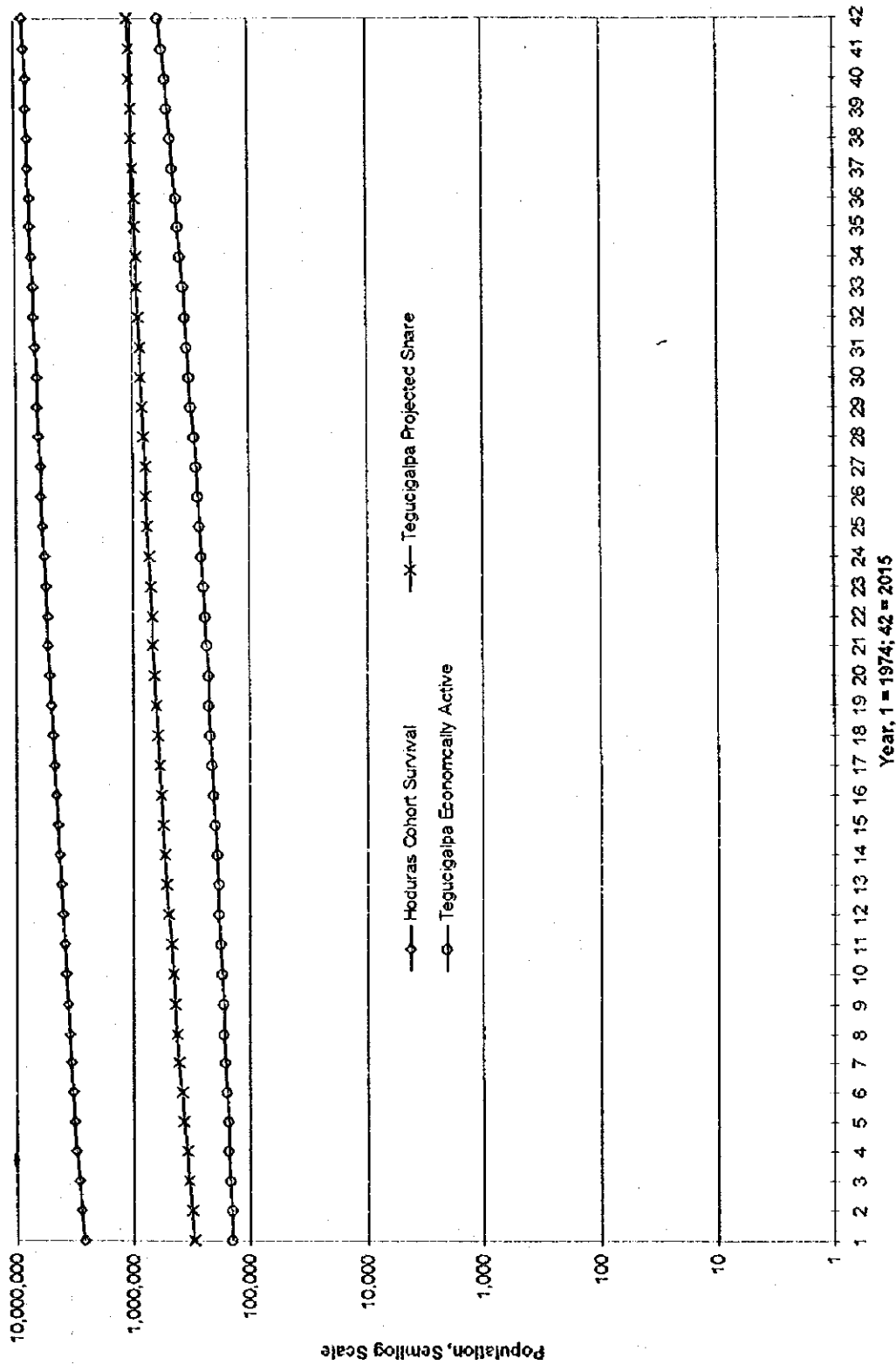


Fig. 8.1.2 Honduras and Tegucigalpa Populations and Tegucigalpa Economically Active Population 1974 to 2015.

Table 8.1.5 Various Population Estimates and Projections For The Central District: 1990-2015

Projections By:	1990	1995	2000	2005	2010	2015	Method
SECPLAN 1993 *	661,385	777,855					Cohort Survival with logistic projection of fecundity. Assumed national migration and longevity. Central District Method not stated.
RAPID IV 1995, High **	600,000	800,000	1,200,000	1,400,000	1,750,000	2,250,000	Derived from SECPLAN, cohort survival method. ***** Central District method not stated.
RAPID IV 1995, Low **	600,000	800,000	1,100,000	1,250,000	1,500,000	1,750,000	Low estimate of two made. no method given for Central District.
SANAA Waste Water 1992	644,500	835,300	1,047,300	1,233,800	1,393,900	1,548,500	Exponential projection, no parameters given to define exponential type; method assumes past growth relationships constant into future.
SANAA-BCEOM Water 1990	660,000	860,000	1,100,000	1,410,000	1,800,000	2,200,000	Appears constant annual multiplier or geometric
Geometric Curve Fit ***	617,595	768,959	955,599	1,176,304	1,478,590	1,840,973	$Y = a \cdot b^x$, or $Y = 269473.7 * 1.044617^x$ year index. Rate of growth = 4.56% a year.
Solid Waste Study 1992, 1	892,000	1,171,000					1992 study used a 1988 population of 800,000, although 1988 census data for the Central District was published in 1990. No explanation of method. Same study applied 5.0% annual increase to an unexplained 1991 population of 760,700.
Solid Waste Study 1992, 2		924,600	1,180,100				
Urban Transportation 1995	581,015	674,922	769,764	863,826	956,002	1,046,385	Computed Central District shares of interpolated national census data, 1950-1988; computed six curves for best fit; used logistic projection of national shares and SECPLAN national projections to obtain Central District projection. ***** Logistic curve, $Y = 1(7.97 + 5.48 * 0.83)$ had a mean absolute error of 1.69%.

SECPLAN 1994, Libro Q estimates a January 1994 population of 624,542 for the Central District by cohort survival projection. *****

* SECPLAN, Honduras: Poblacion Por Municipio 1990-1995. ** USAID, SECPLAN, SEDA, Ministerio Salud Publica, SRN, ASHOLAFA, La Honduras De Hoy Y La Honduras Del Manana. *** By Urban Transportation Team. **** SECPLAN, Proyecciones de Poblacion de Honduras por Sexo y Edad 1988-2050 ***** SECPLAN Honduras, Libro Q: Pobreza, Potencialidad y

Table 8.1.6 Purposes, Comments and Evaluations of the Various Population Projections for the Central District, 1990-2015

Projections By:	Purpose	Evaluation	Comments
SECPLAN 1993	Requested by the Fondo Hondereno de Inversion Social for use in future compensation programs and social administration in general	Projections are too high. Over estimates population in early years and consequently overestimates population in later years. Constant ratio assumptions, especially for migration, over estimate annual rate of growth. Large population increases from 1989 to 1990 are not supported by building permit data. The large gains for 1989 and 1990 may result from adjustments of fecundity and migration estimates.	Used cohort survival method at sub-national level based on 1988 municipal age-sex data. Method is superior to constant growth techniques since it projects components of population growth, births and deaths. It works best for large and stable populations. Municipios are neither large or stable, and extremely sensitive to estimates of migration at the sub-national level. With rapidly growing population, net migration ratios rapidly change. This tends to overestimate growth. SECPLAN used constant rates of migration in proportion to population growth. SECPLAN assumed and adjusted fecundity and fecundity rate of decrease. Maintained constant relation between municipality and nation in projection of mortality. Document claims to be independent of mathematical projection, but used curve fitting to project components. For small Populations, errors can be as large as the projections themselves. Slight deviations, such as number of children per women upset the model. Mortality is improving rapidly, changing from year to year, and constant ratios are inappropriate. Projections have an unexplained discontinuity in annual growth for 1989 and 1990. Annual growth before 1988 was about 3.25 %. SECPLAN growth rate for 1989 was 11 % and for 1990, 10 %. Growth rate for 1991 onward are about 3.5%.
RAPID IV 1995, High and Low Estimates	RAPID IV, funded by USAID, is a family planning program and purpose of projections is to promote family planning and control of population growth	Both Projections are too high for the Central District. The high projection assumes a constant 5 children per women; the low estimate assumes a decrease in the number of children per women by 2025. According to	National projections are based on those of SECPLAN **** and elaborated by RAPID IV participants. Projections explain components of population growth and relationship between decreasing mortality and decreasing birth rate to maintain an almost constant national growth rate of 2.8% or more a year since 1945. A rate of 2.8% doubles population in 25 years. Method of Central District projections are not explained. Use of the high estimates in references to crime rates and other problems of rapid urbanization is misleading. Although with exceptionally high national population increases as real threats to sustainable resources, the problems of urbanization can be better contained by a national urbanization policy linking urban development

Projections By:	Purpose	Evaluation	Comments
	relative to sustainable resources.	SECPLAN, women in the Central District now produce 3.98 children. SECPLAN projects a decline in number of children at a rate of 0.125 a year. This would achieve 2 children per woman by 2004. Assuming a rate of decrease of even 0.10, there would be 2 children per woman by 2008.	to national development. Such a policy might use urban growth controls, emphasize secondary cities, and other techniques to re-direct migration and re-distribute population growth with programs to reduce national population growth by such means as the education of women, increasing employment opportunities, and programs limiting population. The method of projection for the Central District is not explained. No migration estimates or other assumptions are presented. The use of the unrealistic high projection in the text is mis-leading and exaggerates the nature of the problem.
SANAA Waste Water 1992	Estimate population and spatial distribution for the planning future sewer system for the Central District.	Projections are high, establishing too great an increase in the early years which is amplified in later years.	Form of exponential is not explained in report, whether a constant rate of growth or modified exponential of constant ratio of growth increments. The rate of annual change varies for each 5 year period from 5.9%, 1990-1995, to 2.2%, 2010-2015. The estimated rate of change 1987-1988 is 3.2%. 5.9% is a large break in continuity. The periods over which the curve was fit are not specified.
SANAA-BCEOM Water 1990	Estimate population to determine future water demand against which to balance supply by construction of new dams for the Central District	Constant 5.0% annual increase yields projections that are too high and dam construction then is set too early	Unrealistically high population projections would schedule proposed dam construction earlier than required. (Concepcion planning and construction in 1991; proposed Sabacuante Dam in 2003, and proposed Quibra Montes Dam planning and construction in 2007. The projections by SANAA Waste Water, Geometric, Urban Transportation Study, RAID IV Low estimate, and extension of SECPLAN 1993 suggest Sabacuante Dam can be delayed, for example, until 2010 or later, possibly 2015.). Water dam and estimates may be high, especially if price increase with planned privatization of water treatment plants, and contribute to an unnecessarily early scheduling of dam construction and need for French loan.
Geometric Curve Fit	Demonstrate curve fitting results as a comparative	Projections too high at a constant 4.56% a year increase	The geometric curve obtained the best fit to historical data among six curve projections, including linear regression, parabolic, modified exponential, Gompertz, and logistic curves. Data used included all censuses since 1950, with interpolated values. Multiple computations

Projections By:	Purpose	Evaluation	Comments
	guide for appraising other projections		were made using 21 year periods to obtain best (lowest) coefficient of relative variation (CRV) and mean absolute error (MAE). Continued constant rate of increases can not be assumed and rates of actual increase have varied from more 5 % 1950s and early 1960s to little more than 3% in recent years.
Solid Waste Study 1992, 1 and 2	Estimate population to determine future solid waste collection equipment requirements	Projections too high and not well established	Authors did not read one another's chapters. Census data was available for 1988—population estimate for 1988 was not needed. No explanation of discrepancies between projection provided. (Study did obtain needed equipment sale from Japan).
Urban Transportation 1995	Estimate population for land use projection and plan to determine future trips and necessary road improvements	While appearing comparatively low, projections are believed superior in method, assumptions, and continuity to recent growth trends	Method does not attempt separate projection of migration in assumption that the Central District will continue in relationship to Honduras in shares of country population. It is less subject to the error of the SECPAN 1993 projections. Method is cohort survival based in use of SECPAN national cohort survival projections. Issue of number of children per woman is also muted in assumption of continued share relationship. Resulting initial rates of migration are larger than SECPAN 1993 estimates if actual SECPAN children per women are valid. Logistic curve fit of Central District shares projects a 2015 Central District share of 12.5% of Honduran population. The 1950 share was 7.3%; the 1988 share, 12.14%. The economic structure of the Central District, its limited land, and the increasing attraction for migrants to other locations suggests the actual Central District share of Honduran population after 2000 may be less. San Pedro Sula and other cities are growing at a faster rate than the Central District.
SECPAN 1994	Estimate Population by Municipios and those segments living in poverty and below nutritional standard to focus	Population estimate is below transport study estimates for 1993 and start of 1994, but are in general agreement with the transport study estimates.	Cohort survival estimates in a developing economy are less reliable at the sub-national level due to the difficulty of estimating migration. Although slightly lower than the estimates of the transportation study, this SECPAN estimate for January 1994 is in general agreement with the transportation study projections and tend to confirm them.

Analysis of Recent Building Permits. Building permits indicate short term trends in population growth and economic activity. Since 1988, the Central District rate of permit growth has decreased, especially in relation to other cities as shown in the Table 8.1.7 and 8.1.8 and Fig. 7.1.3 and 8.1.4.

Table 1.7 Building Permits: Central District, San Pedro Sula, and Other Cities: 1991-1994

Year	Central District			San Pedro Sula			Other Cities *			Total	
	Permits	Value **	Area	Permits	Value	Area	Permits	Value	Area	Value	Area
1988	2,859	89,904	226,355	2,485	69,153	218,355	2,248	24,590	107,577	7,592	183,647
1989	3,435	121,318	267,074	2,037	84,932	230,821	3,093	36,424	145,196	8,565	242,674
1990	2,884	134,290	279,657	1,901	95,649	242,298	3,359	41,747	138,421	8,144	271,686
1991	2,842	131,570	239,605	1,257	106,252	190,680	2,586	51,123	145,529	6,685	288,945
1992	2,423	176,535	200,669	1,276	132,314	200,084	3,322	96,355	214,791	7,021	405,204
1993	1,743	227,846	184,884	1,451	221,017	285,489	3,324	117,480	226,557	6,518	566,343
1994	1,576	181,730	169,065	1,925	251,415	273,995	4,170	183,720	277,957	7,671	616,865

* Puerto Cortés, La Ceiba, Tela, Villanueva, Choloma, Santa Rosa de Copán, La Lima, El Progreso, Danlí, Choluteca

** In 1,000 Lempira Source: Banco Central De Honduras. Memoria 1992, Memoria 1993, and Memoria 1994

Table 8.1.8 Building Permits Per Cent of Total Issued: Central District, Other Cities, and Honduras, 1988-1994

Year	Central District			San Pedro Sula			Other Cities *		
	Permits	Value	Area	Permits	Value	Area	Permits	Value	Area
1988	37.66%	48.95%	40.99%	32.73%	37.66%	39.54%	29.61%	13.39%	19.48%
1989	40.11%	49.99%	41.53%	23.78%	35.00%	35.89%	36.11%	15.01%	22.58%
1990	35.41%	49.43%	42.35%	23.34%	35.21%	36.69%	41.25%	15.37%	20.96%
1991	42.51%	45.53%	41.61%	18.80%	36.77%	33.11%	38.68%	17.69%	25.27%
1992	34.51%	43.57%	32.60%	18.17%	32.65%	32.51%	47.32%	23.78%	34.89%
1993	26.74%	40.23%	26.53%	22.26%	39.03%	40.96%	51.00%	20.74%	32.51%
1994	20.54%	29.46%	23.45%	25.09%	40.76%	38.00%	54.36%	29.78%	38.55%

* Puerto Cortés, La Ceiba, Tela, Villanueva, Choloma, Santa Rosa de Copán, La Lima, El Progreso, Danlí, Choluteca

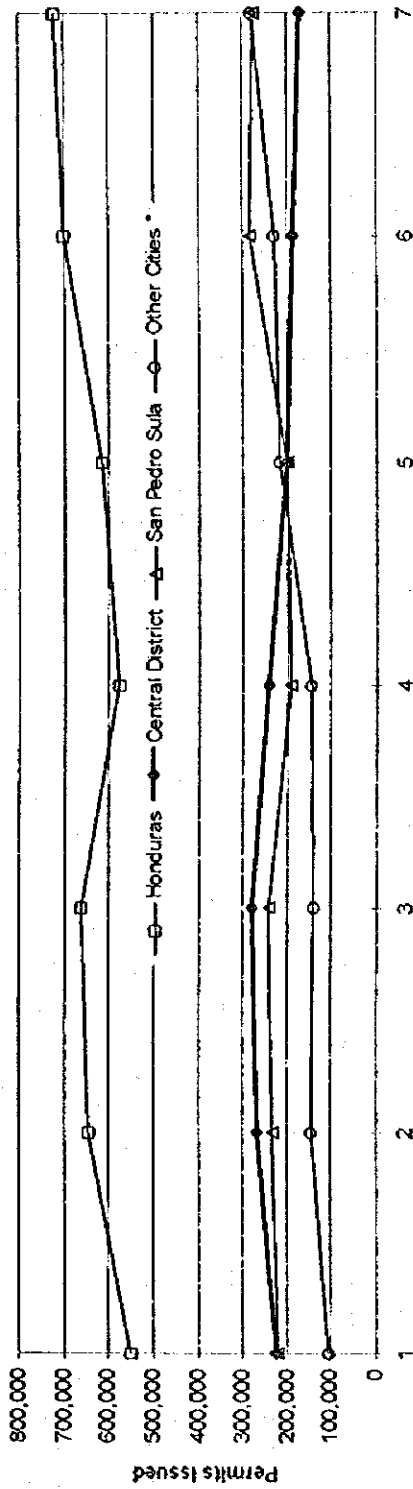


Fig. 8.1.3 Central District, Other Cities, And Honduras Number of Building Permits Issued:1988-1994

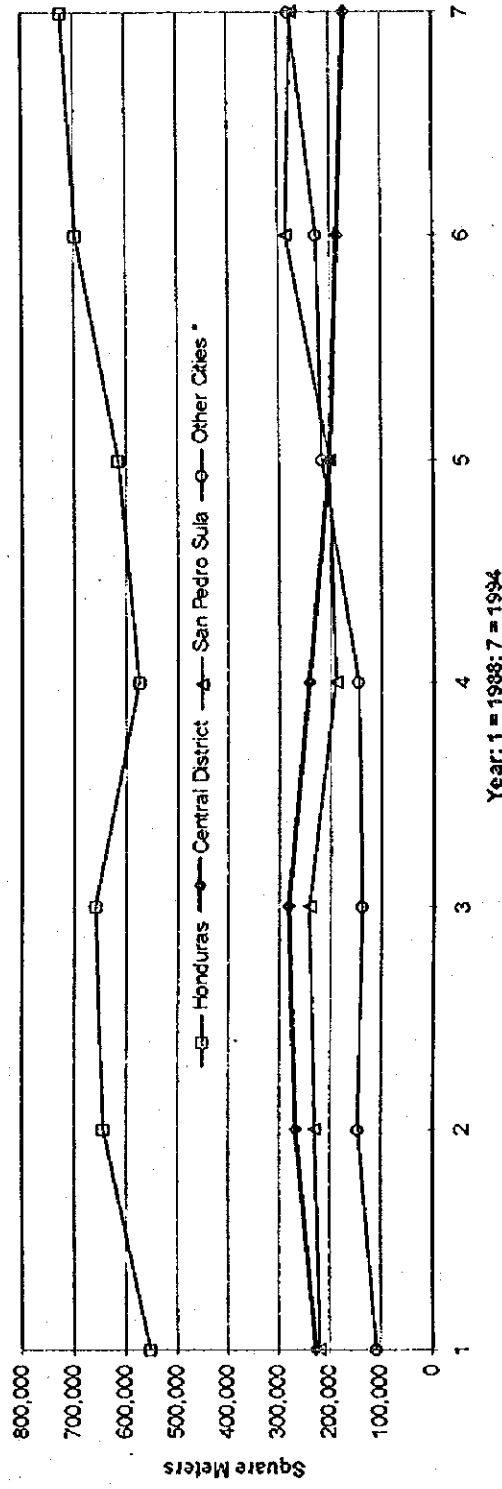


Fig. 8.1.4 Area of Building Permits Issued, 1988-1994:Central District, Other Cities, and Honduras

Table 8.1.9 and 8.1.10 present the data for the preceding graphs.

**Table 8.1.9 Number of Building Permits Issued 1988-1994:
Central District, Other Cities, and Total**

Year:	1988	1989	1990	1991	1992	1993	1994
Honduras	7,592	8,565	8,144	6,685	7,021	6,518	7,671
Central District	2,859	3,435	2,884	2,842	2,423	1,743	1,576
San Pedro Sula	2,485	2,037	1,901	1,257	1,276	1,451	1,925
Other Cities *	2,248	3,093	3,359	2,586	3,322	3,324	4,170

* Puerto Cortes, La Ceiba, Tela, Villanueva, Choloma, Santa Rosa de Copan, La Lima, El Progreso, Danli, Choluteca

Source: Banco Central De Honduras, *Memoria 1992, Memoria 1993, and Memoria 1994*

**Table 7.1.10 Area of Building Permits Issued 1988-1994: Central District, Other Cities,
and Total
In Square Meters**

Year:	1988	1989	1990	1991	1992	1993	1994
Honduras	552,287	643,091	660,376	575,814	615,544	696,930	721,017
Central District	226,355	267,074	279,657	239,605	200,669	184,884	169,065
San Pedro Sula	218,355	230,821	242,298	190,680	200,084	285,489	273,995
Other Cities *	107,577	145,196	138,421	145,529	214,791	226,557	277,957

* Puerto Cortes, La Ceiba, Tela, Villanueva, Choloma, Santa Rosa de Copan, La Lima, El Progreso, Danli, Choluteca

Source: Banco Central De Honduras, *Memoria 1992, Memoria 1993, and Memoria 1994*

Discussion The District Central, Pedro Sula, and the other cities grew in number of permits and permitted area in 1989 and 1990 with declines in 1991. San Pedro Sula, other cities, and the total have continued to show positive rates of growth in 1992, 1993, and 1994. The Central District, in contrast, has grown since 1991 at a decreasing, or negative rate, from 1988 to 1994 and has not shown increases at a positive rate since 1993. It has only shown an upward increase since 1994. It dropped from a rate of increase of 20 per cent in 1988-89 to a minus 16 per cent in 1990, as shown in the following table, and has only in 1994 lessened its rate of change to a minus 9.5 per cent in the period 1993-94. San Pedro Sula declined in its rate of growth from 1989 to 1991, but has since shown positive rates of growth 1992 to 1994. The number of permits issued in San Pedro grew in 1993-94 at a rate of 33 per cent. The other cities experienced a negative rate of growth in 1991 but all other years have been positive with growth in 1993-94 of 25 per cent. These per cent changes are illustrated in the Fig. 8.1.3 of the following page.

**Table 8.1.11 Per Cent Change By Year in Building Permits Issued In Central District
And Other Cities, 1988 to 1994**

Year:	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Total	-	12.82%	-4.92%	-17.92%	5.03%	-7.16%	17.69%
Central District	-	20.15%	-16.04%	-1.46%	-14.74%	-28.06%	-9.58%
San Pedro Sula	-	-18.03%	-6.68%	-33.88%	1.51%	13.71%	32.67%
Other Cities *	-	37.59%	8.60%	-23.01%	28.46%	0.06%	25.45%

* Puerto Cortes, La Ceiba, Tela, Villanueva, Choloma, Santa Rosa de Copan, La Lima, El Progreso, Danli, Choluteca

The kinds of permit growth are more pronounced in area and permit category. San Pedro Sula and the other cities have surpassed the Central District in both number and area. The number of commercial permits issued in the Central District has declined since 1990. Industrial permits have declined since 1989. Only two industrial permits were issued in 1992 and none since then in the Central District. San Pedro Sula, in contrast, has averaged 8 industrial permits a year and 7,000 square meters in area a year

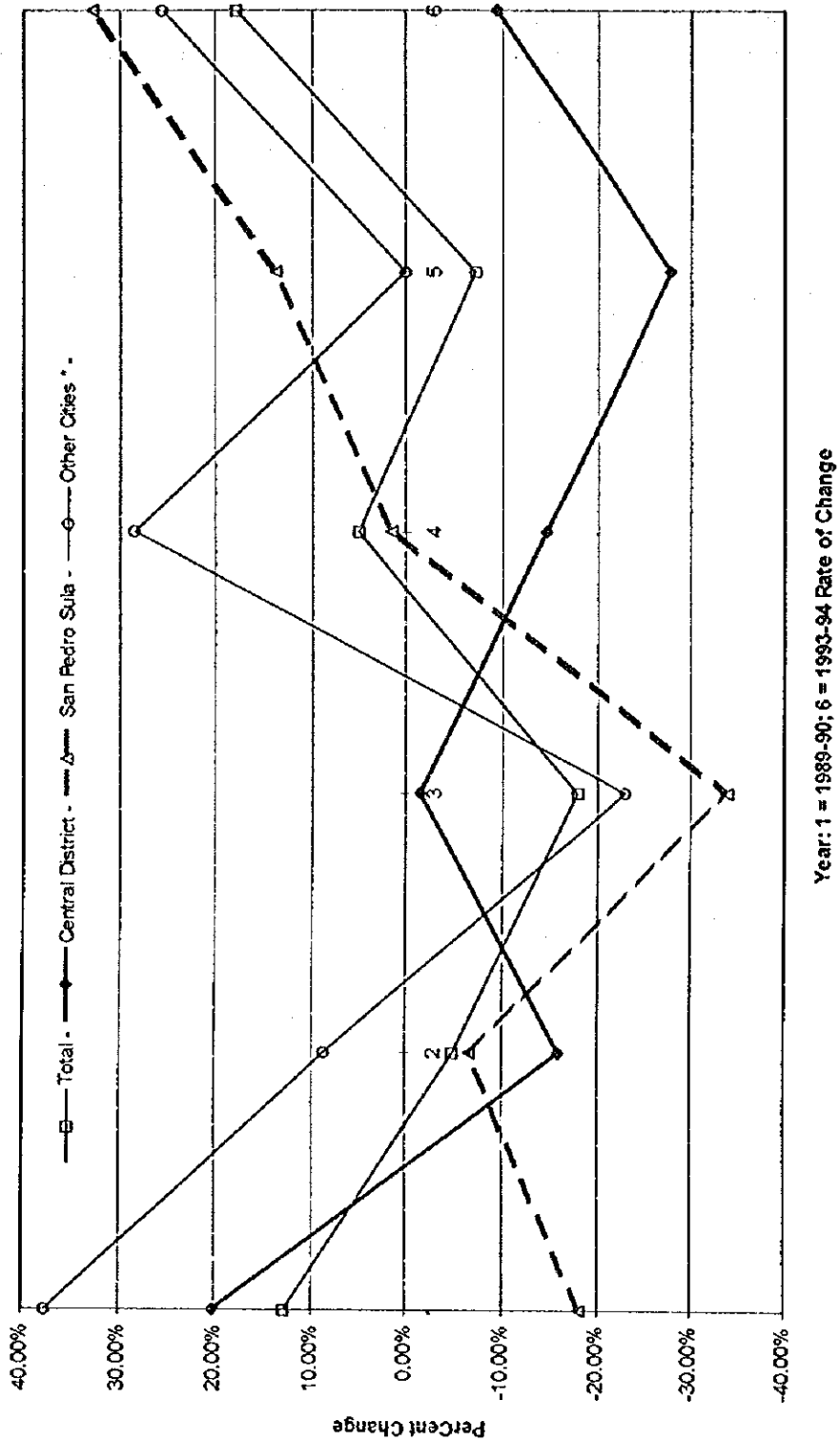


Fig. 8.1.3 Rates of Change in Building Permits Issued: 1989-1994

since 1992. The other cities have averaged 11 permits a year and 24,000 square meters a year since 1992.

Conclusions. Although only recording growth in the formal sector, the declines in Central District building permits indicate a slowing of growth from 1988 to 1994. Informal residential (for which no permits may have been issued) growth may have continued into the 1990s with a lag in construction, but the declines in commercial and industrial permits indicate a decline in employment growth and no urban expansion in recent years based on new industrial activity. San Pedro Sula has surpassed the Central District in rate of growth and shows consistent commercial and industrial growth since 1992, as has the remainder of Honduran cities. These trends are not limited to rates of increase alone, but are valid in absolute numbers as well (see Table 7.1.10). SECPLAN estimated Population growth in San Pedro Sula (by sample surveys) to be about 5 per cent a year since 1988. This is consistent with the permit data and greater than the rate of the Central District.

In contrast, the data for the Central District raises questions about recent population estimates by SECPLAN for the Central District, which according to SECPLAN, grew from 539,590 people in 1988, the census year, to 661,385 people in 1990 in estimates made by sample. According to SECPLAN, the Central District grew in population in 1990 by 11 per cent and in 1991 by 10 per cent. These rates of growth contrast with a range of growth rates projected by SECPLAN of 3.5 per cent in 1991 to 3 per cent in 1995 and an average annual growth rates for the District before 1988 of 4.2 to about 3.2 per cent in 1987 and 1988. Table 8.1.12 contrast the projections made for the District by the study with those of SECPLAN.

Table 8.1.12 Differences Between Study Population Projections and Those of SECPLAN for 1990 to 1995

Source	1988	1989	1990	1991	1992	1993	1994	1995
SECPLAN*	539,590	600,487	661,385	884,609	708,071	731,474	754,753	777,855
This Study	541,538	562,917	581,015	599,493	618,350	637,156	656,085	674,922
Difference	-1,948	37,570	80,370	851,16	89,721	94,318	98,668	102,933
SECPLAN Increase **		11.29 %	10.15 %	3.51 %	3.43 %	3.31 %	3.18 %	3.06 %
Study Increase **		3.95 %	3.22 %	3.18 %	3.15 %	3.04	2.97 %	2.79 %

* Source: SECPLAN, Honduras: Poblacion Por Municipio 1990-1995

** Increase is annual rate of increase.

As noted in the section evaluating various population projections, the 1993 SECPLAN projections appear to high with unrealistic rates of annual growth given past continuity of trend, national cohort survival projections, and SECPLAN estimates of the future number of children per women. For these reasons and because of what is believed a better means of estimating migration used in this study, this study will use the Central District shares of Honduras cohort survival growth projections, as smoothed mathematically to a logistic curve, for land use planning².

² See Working Paper Number 2. The cohort survival projections are from SECPLAN, Proyecciones de Poblacion de Honduras por Sexo y Edad 1988-2050. The main parts are replicated in the first part of this Appendix

Comment. The industrial permit data for the District and San Pedro Sula supports a proposed policy for limiting manufacturing growth in the District and the amount of industrial land to current amounts. The District has little land to expand upon, has limited water supply, or costly water supply, for expansion, and is comparatively at a disadvantage for industrial expansion with little level land and appropriate access. Central District industries are footloose, dependent on cheap labor, and have no other unique and sustainable industrial advantage. Additional electric power for the District will be obtained by construction of thermal plants and transport of fuel with the added cost of mountainous transport.

San Pedro Sula has level land for industrial expansion, a rail road connection to the principal port of Honduras and the Caribbean coast, cheaper transportation costs, little land limitation, and equal access to cheap labor. If for example manufacturing employment in the Central District were held to a 1995 level by diverting industrial jobs elsewhere, this would reduce the number of basic employees by some 15,507 jobs by 2015. Given an economic base multiplier of 2.37, this would reduce the number of local employees by 2015 36,752 , or a total of 52,258 jobs³. This in turn would reduce the residential requirement for land by approximately the same number of households, 52,200, equating to a total population of about 198,550 persons. A national urban policy linking urban development to national development would seek the best distribution of jobs and population for urban development and the national economy. Diversion of Central District growth could be a part of such a national policy.

³ See Working Paper Number 4 for calculations of the economic base multiplier and its uses. The multiplier is subject to revision upon the obtaining of more detailed economic data from SECPLAN. The main parts of this paper are replicated in Appendix 7.3.

Appendix 8.2 Central District Economic Base and Projection of the Economically Active Population

Given limitations of land, water, and other resources in the Central District, an understanding of local economic specialization and strengths and ways to assess economic impacts is useful for developing policy for sustained urban development. The theory and methods of base multiplier calculation were presented in Chapter 7. This Appendix explains adjustments to the economic data and to estimates of the economically active population used in non-residential land use projections.

Data The data used for the base multiplier analysis are taken from the SECPLAN series, *Programa De Encuesta De Hogares*, October 1994. Table 9 of the *Hogares* data provides nine, one digit industrial codes, although the data collected by four digit industrial codes. Two digit industrial codes would provide a more accurate analysis, but SECPLAN was unwilling to release data by two digit industrial classifications, since it required separate machine tabulation and since the data were derived from small samples rather than establishment reporting and believed inaccurate in two digits. It was possible, nonetheless, to gain some finer industrial classifications, using SECPLAN Tables 10 and 11 in addition to Table 9, by cross tabulation and re-assignment of coding. Agricultural Services, for example, should be classified under Agriculture Services, not Services.

In other instances the SECPLAN coding confuses employer with the nature of the economic activity. Electricity and Utility employees are withheld by SECPLAN from the Transportation, Communications, and Utilities category of standard industrial coding since they are public employees. The number of employees in this SECPLAN coding were shifted to the Transportation and Utilities category. Similarly, where the reported data permitted, other public employee categories were added or subtracted to conform to analytic convention. Table 8.3, Chapter 7, shows the results, along with percentages, location quotients, and basic employment. The base multiplier calculated on more detailed information was 1.593. Calculated with single digit codes the base multiplier would have been 2.73, a gross over estimation.

Base Classification Agriculture and Mining, are basic employers by convention, although in actual computation, they have a value of less than one for the Central District. Domestic Services, although yielding a location quotient of 1.759, are local not basic (since they export nothing), services and classed as such in the table. Non-classified Establishments are usually excluded from the analysis. Government employs are considered nonbasic if local and basic if national (the employment is external to the local economy). Reporting by SECPLAN does not permit disaggregation of local from national public employees. The number of basic employees as a consequence is not as large as it could be and the resulting multiplier over estimates the ratio of local to basic employment. The National University is a significant basic employer. Again SECPLAN practice does not permit estimation of this sector.

Appraisal of Method The economic base method is the most used urban economic analytic technique because of its simplicity, although the more sophisticated input output analysis is the

data available and in light of no other alternative, it can be used with caution for short term projections and impact analyses. Assuming an invariant base multiplier, the technique has use in determining the impact of growth policies. Given the limitation of land, water and other resources in the central District, an understanding of local economic specialization and strengths and a means of impact assessment, however flawed, is useful in forming development policy.

Employment Projections Projections the economically active population, in lieu of actual employed, were made by curve fitting since economic data for projection by economic base was insufficient. As with other projections used in this study, both methods required interpolation to obtain enough data points for curve fitting. Data from the 1974 and 1988 censuses were used along with proportionally adjusted economic data from the 1993 and 1994 SECPLAN, *Programa De Encuesta De Hogares*. Six curve types were computed in search of a best fit. The results are shown in Table 8.2.1 for the logistic curve projection. Fig. 8.1.1 and 8.1.2 (Appendix 7.1) illustrate these projections. Fig. 8.2.1 shows the relationship to Central District Population semi-logarithmically. These data do not conform to projections of the active population made by SECPLAN for many of the reasons presented in Appendix 7.1. The data for 1994 was adjusted to conform more closely to actual trend, primarily the estimates of this study for the Central District population. As explained in Appendix 7.1, The SECPLAN estimates for 1989 and 1990 are overly large, in contrast to previous and following years, and increases of these two year are not supported by building permit and other data.

Table 8.2.1 Population Projections: Honduras, Central District, and Central District Economically Active Population, 1974 - 2015

Year	Projected Population			Year	Projected Population		
	Honduras Cohort Survival *	Central District Logistic Share	Economic Active		Honduras Cohort Survival	Central District Logistic Share	Economic Active
1974	2,656,948	300,870	142,493	1995	5,462,795	674,922	245,099
1975	2,784,575	317,963	145,675	1996	5,608,275	693,873	252,917
1976	2,912,201	335,298	148,970	1997	5,754,542	712,807	261,171
1977	3,039,828	352,462	152,385	1998	5,901,239	731,838	269,897
1978	3,167,455	369,834	155,927	1999	6,048,156	750,792	279,137
1979	3,295,081	387,018	159,602	2000	6,194,926	769,764	288,938
1980	3,422,708	404,380	163,419	2001	6,341,717	788,646	299,351
1981	3,550,335	421,547	167,384	2002	6,488,792	807,594	310,436
1982	3,677,961	438,865	171,507	2003	6,635,533	826,417	322,259
1983	3,805,588	455,988	175,798	2004	6,781,849	845,213	334,895
1984	3,933,214	473,239	180,265	2005	6,927,291	863,826	348,431
1985	4,060,841	490,300	184,922	2006	7,072,313	882,408	362,967
1986	4,188,468	507,469	189,778	2007	7,217,359	900,928	378,615
1987	4,316,094	524,458	194,848	2008	7,362,066	919,423	395,509
1988	4,443,721	541,538	200,146	2009	7,506,058	937,771	413,802
1989	4,607,924	562,917	205,686	2010	7,648,997	956,002	433,675
1990	4,744,540	581,015	211,487	2011	7,790,739	974,034	455,341
1991	4,885,493	599,493	217,565	2012	7,932,480	992,077	479,053
1992	5,028,969	618,350	223,943	2013	8,074,222	1,010,076	505,114
1993	5,173,141	637,156	230,640	2014	8,215,963	1,028,085	533,889
1994	5,317,831	656,085	237,684	2015	8,357,705	1,046,385	565,824

* Projections for cohort survival are taken from SECPLAN, Proyecciones De Poblacion De Honduras Por Sexo Y Edad 1988-2050. Curve Details: $Y_c = 1 / (c + a * b^x) = Y_c = 1 / (-0.00000964 + 0.00001658 * 0.990757^x)$. Limit = $1/c = -104557$ and is uninteresting. Coefficient of Relative Variation = 18.49. Mean Deviation = 86.1218. Mean Absolute Percentage Error = 0.698%.

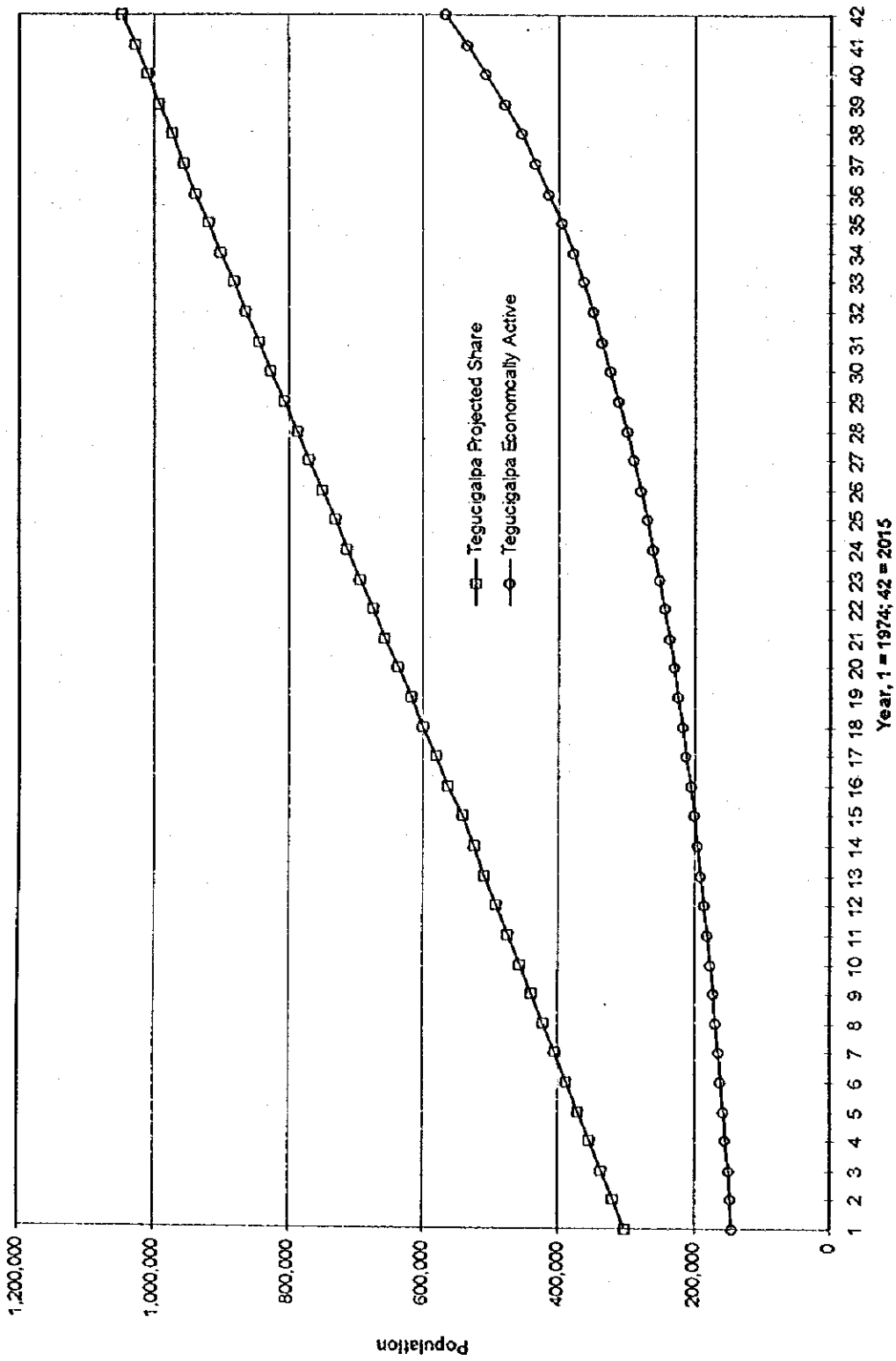


Fig. 8.2.1 Tegucigalpa Projected Share of Honduras Population and Projected Tegucigalpa Economically Active Population: 1974 to 2015

**Appendix 7.3 Number of Population, Households, Students,
and Car Owning Households by Zone (1995 and 2010)**

Zone No.	Population		Student (1995)		Student (2010)		Household		Household	
	(1995)	(2010)	House Place	School Place	House Place	School Place	(1995)	(2010)	Car Own (1995)	Car Own (2010)
1	5510	5277	1697	5287	1625	4163	1247	1427	283	387
2	1000	900	308	8412	277	6672	265	286	66	85
3	3260	2972	1004	5955	915	4785	946	1031	223	289
4	5970	5984	1839	881	1843	778	1403	1681	228	326
5	10090	10785	3108	1015	3322	956	2725	3482	502	764
6	5130	5252	1580	187	1618	169	1206	1476	218	318
7	7460	7511	2298	2297	2313	2038	1853	2231	265	380
8	5110	5211	1574	267	1605	240	1196	1458	187	272
9	6500	5199	2002	2270	1601	1600	1772	1695	1170	1332
10	4300	4234	1324	2884	1304	2503	968	1139	439	616
11	3800	3758	1170	1175	1157	1024	842	996	165	232
12	1760	1590	542	347	490	276	468	505	61	79
13	9100	7548	2803	294	2325	215	2371	2351	421	497
14	7500	7491	2310	6676	2307	5877	2064	2464	193	275
15	9400	9370	2895	7424	2886	6522	3220	3837	475	675
16	8830	8921	2719	6863	2748	6111	2185	2639	315	453
17	7700	7882	2371	347	2428	313	1781	2180	170	248
18	10030	11689	3089	1175	3600	1207	2363	3292	158	262
19	46400	47670	14290	5234	14682	4739	10591	13008	489	715
20	24500	25438	7546	2724	7834	2493	5646	7008	850	1256
21	41030	42451	12637	5127	13074	4675	8383	10369	287	423
22	19270	20978	5935	7717	6461	7404	3847	5007	549	851
23	9000	9568	2772	401	2947	376	1083	1376	123	186
24	9500	9854	2926	614	3035	561	2038	2527	213	315
25	6600	6785	2033	1362	2090	1234	1451	1784	55	81
26	6000	6112	1848	1629	1882	1462	1340	1631	316	458
27	6880	6994	2119	1442	2154	1292	1426	1733	304	440
28	2250	3762	693	294	1159	433	530	1059	444	1058
29	7000	7857	2156	3525	2420	3487	2206	2960	1481	2366
30	1800	3369	554	53	1038	87	413	924	341	910
31	2900	3878	893	507	1194	598	709	1134	535	1019
32	1880	2441	579	427	752	489	392	608	77	143
33	3050	4123	939	374	1270	446	825	1333	422	813
34	4100	4163	1263	294	1282	263	903	1096	750	1084
35	5000	6605	1540	1415	2034	1647	1128	1781	956	1799
36	3240	5946	998	1335	1831	2159	702	1541	306	789
37	6000	7268	1848	10788	2238	11517	1409	2041	682	1176
38	9400	14837	2895	2937	4570	4086	2022	3815	381	857
39	9700	9586	2987	1976	2952	1721	1993	2355	350	492
40	14000	20893	4312	7263	6435	9553	3091	5515	1196	2540
41	3600	8814	1109	107	2715	231	651	1906	128	446
42	6300	12036	1940	107	3707	180	1358	3101	153	416
43	15500	19319	4774	1335	5950	1466	3205	4776	122	216
44	5430	8219	1672	1656	2531	2209	1980	3582	11	24
45	1260	1409	388	561	434	553	260	347	138	219
46	9500	10482	2926	1122	3228	1091	1938	2557	73	115
47	18100	22029	5575	2804	6785	3008	3538	5147	357	619
48	3360	8126	1035	2804	2503	5977	791	2287	675	2323
49	2000	4636	616	30335	1428	61972	434	1204	298	984
50	1300	3798	400	1816	1170	4676	269	941	242	1008
51	8000	14858	2464	427	4576	699	1860	4129	83	219
52	16660	21633	5131	5795	6663	6632	3927	6095	696	1287
53	7900	11767	2433	160	3624	210	1601	2851	987	2093
54	19700	23894	6067	3017	7359	3225	4345	6300	2837	4900
55	4500	8180	1386	53	2519	85	973	2115	105	272
56	36740	39568	11315	10601	12186	10062	8142	10483	1622	2487
57	5140	7734	1593	401	2382	532	1224	2201	156	334
58	19600	24845	6036	5100	7652	5698	4009	6074	557	1005
59	9900	16318	3049	988	5026	1435	2014	3969	350	821
60	10160	15247	3129	507	4696	671	2244	4025	1603	3426
61	20150	22482	6206	3124	6924	3072	4185	5582	473	752
62	3400	9680	1047	828	2981	2078	732	2493	573	2321
63	5400	17482	1663	614	5384	1752	1167	4516	822	3790
64	10540	19035	3246	1522	5862	2422	2417	5218	1959	5037
65	9000	9073	2772	1282	2794	1139	1805	2175	171	246
66	14500	16126	4466	855	4967	838	2941	3910	226	357
67	10100	14568	3111	2697	4487	3428	2074	3576	223	458
68	16300	53301	5020	9402	16416	27096	3404	13306	163	760
69	1070	4959	330	427	1527	1744	257	1423	6	39
70	1040	5047	320	415	1554	1775	250	1448	3	21
71	1660	8132	511	187	2505	807	356	2085	25	172
72	7400	8095	2279	2642	2493	2547	1792	2344	158	247
73	1380	1578	424	123	485	124	276	378	8	13
74	16380	17451	5046	2857	5378	2684	3459	4408	161	244
Total	674920	872083	207865	207865	268587	268587	150880	231723	32810	64939

Appendix 8.4 Number of Workers by Zone (1995)

Zone No.	Worker (Night) 1995				Worker (Day) 1995			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
1	0	428	1665	2093	0	614	13359	13973
2	0	40	334	373	0	673	16226	16899
3	0	292	949	1241	0	608	12269	12877
4	0	277	1820	2097	0	31	346	377
5	0	826	2923	3749	0	22	235	257
6	0	54	1822	1877	0	48	413	462
7	0	561	2168	2729	0	141	598	739
8	0	604	1009	1613	0	116	595	711
9	0	69	2394	2463	0	2117	7356	9473
10	0	21	1557	1578	0	2531	5873	8404
11	0	424	948	1372	0	2234	4476	6710
12	0	65	548	613	0	2752	971	3723
13	0	508	2842	3350	0	348	1616	1964
14	0	367	2448	2814	0	725	8458	9183
15	0	697	2746	3443	0	1097	5944	7041
16	0	161	2912	3073	0	123	1965	2088
17	0	18	2365	2383	0	226	934	1160
18	19	604	2839	3461	19	189	3981	4188
19	98	2155	11978	14231	98	98	2145	2341
20	56	991	7192	8239	56	1679	6797	8532
21	480	6414	8344	15239	480	1197	3607	5284
22	69	1858	5144	7071	69	2622	4644	7335
23	25	811	2417	3253	25	277	1034	1336
24	0	1151	1695	2846	0	226	789	1014
25	543	814	978	2366	543	176	399	1118
26	103	86	1812	2001	103	363	472	938
27	699	237	1332	2269	699	190	916	1805
28	0	26	799	826	0	320	523	843
29	0	627	1968	2594	0	376	1228	1604
30	77	59	547	684	77	552	952	1581
31	253	15	812	1080	253	488	3230	3971
32	0	26	543	569	0	188	396	582
33	0	194	857	1052	0	623	4018	4641
34	354	176	974	1504	354	387	2269	3011
35	1385	238	308	1932	1385	696	1947	4028
36	0	62	1155	1216	0	459	3149	3608
37	26	157	2093	2276	26	679	1383	2088
38	47	21	2885	2953	47	2116	2298	4461
39	0	466	2241	2707	0	589	354	943
40	88	816	3953	4856	88	1662	2131	3881
41	40	475	673	1188	40	322	457	819
42	85	589	1181	1855	85	405	541	1031
43	67	1576	2902	4544	67	524	579	1169
44	10	84	2044	2138	10	98	928	1036
45	12	24	433	469	12	307	493	813
46	38	1949	735	2721	38	209	428	675
47	131	1421	5107	6658	131	409	1248	1788
48	0	163	1123	1286	0	321	2027	2348
49	0	26	702	728	0	173	2147	2320
50	0	15	471	485	0	137	1313	1450
51	0	738	2139	2877	0	152	281	433
52	72	1290	4531	5893	72	134	1480	1686
53	0	201	2837	3037	0	2297	5494	7791
54	242	2156	4916	7315	242	895	3550	4687
55	0	21	1365	1385	0	1819	1759	3578
56	179	1062	10896	12137	179	1016	3283	4478
57	0	26	1490	1517	0	936	212	1148
58	204	1174	5553	6931	204	719	865	1788
59	74	1095	2583	3751	74	87	128	288
60	48	722	3146	3916	48	271	960	1280
61	0	3321	2802	6123	0	567	2967	3534
62	0	488	786	1274	0	742	1100	1842
63	101	592	1319	2012	101	2781	985	3867
64	26	1315	2702	4043	26	746	802	1573
65	0	265	2334	2598	0	863	2785	3648
66	192	1144	2802	4139	192	2399	1257	3848
67	65	1438	1396	2899	65	544	539	1148
68	30	1792	2711	4533	30	742	996	1768
69	2	149	226	377	2	79	258	339
70	1	141	225	366	1	47	409	457
71	0	302	159	461	0	268	314	582
72	0	808	1386	2194	0	38	832	871
73	0	18	382	400	0	13	349	362
74	268	1589	4168	6026	268	27	480	775
Total	6209	51642	172541	230333	6209	51642	172542	230333

Appendix 8.5 Number of Workers by Zone (2010)

Zone No.	Worker (Night) 2010				Worker (Day) 2010			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
1	0	538	2218	2756	0	586	14585	15171
2	0	47	415	462	0	599	18029	18628
3	0	350	1206	1556	0	609	11904	12513
4	0	365	2526	2891	0	31	666	697
5	0	1159	4350	5510	0	22	453	475
6	0	73	2569	2642	0	65	795	859
7	0	741	3036	3777	0	189	1149	1338
8	0	810	1452	2262	0	155	572	727
9	0	72	2636	2709	0	3861	13183	17044
10	0	27	2109	2136	0	4397	11766	16163
11	0	551	1314	1865	0	3692	11829	15521
12	0	77	684	761	0	4785	934	5719
13	0	553	3267	3820	0	665	1751	2416
14	0	481	3384	3865	0	968	9280	10249
15	0	912	3896	4719	0	1778	6517	8395
16	0	214	4055	4269	0	194	2361	2555
17	0	24	3329	3353	0	401	1796	2197
18	25	924	4597	5545	25	352	7655	8032
19	130	2907	17064	20101	130	162	4124	4416
20	75	1351	10336	11762	75	2985	11372	14432
21	637	8717	12323	21677	637	2435	3977	7049
22	92	2656	7836	10584	92	3938	8586	12617
23	33	1132	3589	4754	33	369	1074	1477
24	0	1568	2491	4059	0	501	1516	2017
25	721	1140	1483	3344	721	435	768	1924
26	137	116	2551	2803	137	582	907	1626
27	928	317	1925	3171	928	354	1761	3044
28	0	58	1840	1898	0	529	794	1323
29	0	924	3080	4004	0	612	2362	2974
30	103	145	1512	1760	103	837	1952	2892
31	336	26	1624	1986	336	851	8117	9304
32	0	45	971	1016	0	348	487	835
33	0	345	1609	1954	0	932	11396	12328
34	470	235	1395	2100	470	617	2552	3640
35	1839	413	1256	3508	1839	1229	4906	7974
36	0	148	2920	3069	0	1083	6647	7730
37	35	250	3506	3790	35	1698	2660	4392
38	63	43	6303	6408	63	3196	4419	7678
39	0	605	3073	3679	0	986	375	1361
40	116	1657	8252	10026	116	2509	4098	6724
41	53	1529	2418	4000	53	431	659	1142
42	113	1479	3281	4873	113	541	888	1542
43	88	2590	5119	7787	88	699	876	1664
44	13	168	4268	4449	13	262	867	1142
45	17	35	670	721	17	510	949	1475
46	50	2824	1254	4129	50	379	505	934
47	173	2272	8697	11142	173	746	2041	2960
48	0	517	3757	4275	0	629	14541	15170
49	0	81	2239	2320	0	331	4128	4459
50	0	56	1893	1950	0	283	4411	4694
51	0	1800	5546	7345	0	401	541	942
52	96	2199	8225	10520	96	279	2846	3221
53	0	393	5827	6220	0	3567	20445	24012
54	322	3435	8442	12199	322	2929	11656	14907
55	0	49	3413	3462	0	2942	3383	6325
56	238	1502	16231	17971	238	1696	4902	6836
57	0	52	3085	3138	0	2141	296	2438
58	271	1955	9854	12080	271	1032	1212	2515
59	98	2370	6034	8502	98	177	246	520
60	64	1423	6592	8079	64	363	1847	2273
61	0	4867	4526	9393	0	1386	3994	5380
62	0	1825	3161	4987	0	1091	2103	3194
63	134	2519	6302	8955	134	3614	1114	4862
64	35	3119	6884	10038	35	2591	1668	4293
65	0	350	3251	3601	0	3191	9356	12547
66	255	1672	4402	6329	255	3992	4417	8664
67	86	2725	2937	5748	86	1813	1058	2957
68	40	7699	12642	20381	40	1913	1984	3937
69	2	907	1492	2401	2	212	496	711
70	1	898	1545	2444	1	126	786	914
71	0	1944	1164	3108	0	357	453	811
72	0	1161	2140	3300	0	107	1601	1708
73	0	27	602	629	0	34	672	706
74	353	2225	6254	8831	353	71	923	1347
Total	8240	91374	308042	407656	8240	91374	308042	407656

Appendix 8.6 Area by Land Use (1995 and 2010)

Zone No.	Residence Area 1995	Residence Area 2010	Factory Area 1995	Factory Area 2010	Commerce Area 1995	Commerce Area 2010
1	19.7	18.7	0.7	0.7	31	29.2
2	11.3	9.9	0.6	0.5	36	34.5
3	7.1	6.8	0.8	0.8	22	18.4
4	25.7	23.5	0.1	0.3	0.5	0.8
5	31.1	30.5	0.1	0.3	0.5	0.8
6	15.9	11.3	0.2	0.3	0.5	0.8
7	39.8	43.9	0.2	0.3	0.5	0.8
8	29.7	34.1	0.3	0.4	2.0	1.7
9	40.9	42.5	2.7	4.5	18.0	49.0
10	14.5	26.8	3.3	5.3	11.0	35.2
11	17.0	19.9	2.9	4.2	7.0	24.1
12	5.0	6.3	3.6	5.4	2.0	1.7
13	24.5	24.1	0.5	0.7	33.0	30.9
14	29.6	28.7	0.8	1.1	51.0	48.3
15	24.4	22.4	1.3	1.9	76.0	73.0
16	24.4	21.1	0.2	0.3	8.0	8.3
17	35.4	31.2	0.3	0.4	0.5	0.8
18	50.3	54.8	0.3	0.4	0.5	0.8
19	105.2	111.9	0.1	0.3	0.5	0.8
20	50.6	53.5	2.3	3.6	40.0	57.8
21	131.3	148.0	1.5	2.3	15.0	14.3
22	69.2	77.2	3.2	4.8	70.0	111.7
23	39.9	51.6	0.4	0.5	5.0	4.5
24	33.1	35.1	0.3	0.4	0.5	0.8
25	21.2	37.2	0.2	0.3	0.5	0.8
26	34.2	80.9	0.5	0.7	0.5	0.8
27	32.6	35.6	0.3	0.4	0.5	0.8
28	39.8	48.9	0.4	0.5	1.9	24.9
29	47.7	61.4	0.4	0.5	0.5	0.8
30	28.2	42.4	0.8	1.1	15.0	26.6
31	12.6	31.0	0.7	0.9	30.0	65.1
32	9.1	29.4	0.3	0.4	10.0	10.6
33	7.3	30.1	0.9	1.2	20.0	49.0
34	30.2	33.1	0.5	0.7	20.0	19.4
35	13.6	22.4	0.5	0.7	29.0	63.1
36	22.8	46.8	0.6	0.8	41.0	74.7
37	34.4	70.6	0.9	4.2	0.5	0.8
38	32.3	83.8	3.3	4.6	0.5	0.8
39	24.5	18.3	0.8	1.1	6.0	5.5
40	70.4	102.1	2.3	3.4	0.5	0.8
41	90.7	106.3	0.4	0.5	16.0	19.9
42	80.8	91.3	0.6	0.8	13.0	18.4
43	202.6	231.9	0.7	0.9	8.0	10.5
44	18.5	23.0	0.1	0.3	7.0	5.6
45	6.7	14.8	0.4	0.5	0.5	0.8
46	35.4	41.8	0.3	0.4	15.0	15.3
47	120.8	145.5	0.6	0.8	10.0	14.1
48	60.3	93.0	0.4	0.5	23.0	44.5
49	15.4	36.7	0.2	0.3	0.5	0.8
50	27.6	48.6	0.2	0.3	15.0	43.5
51	108.0	140.5	0.2	2.8	0.5	0.8
52	58.0	75.0	0.2	0.3	0.5	0.8
53	12.8	42.1	3.3	4.4	34.0	82.5
54	113.7	151.9	1.2	1.6	16.0	25.9
55	8.7	30.4	2.5	3.3	0.5	0.8
56	203.2	221.9	1.6	2.7	17.0	21.9
57	91.9	111.8	1.4	3.2	8.0	9.6
58	191.3	213.7	1.0	1.3	7.0	8.5
59	39.8	49.0	0.1	2.8	0.5	0.8
60	46.2	54.2	0.4	0.5	0.5	0.8
61	46.4	65.1	0.8	3.3	9.0	10.5
62	48.4	88.4	1.0	1.3	17.0	23.1
63	45.8	197.3	4.0	5.3	25.0	24.4
64	84.0	167.8	1.0	2.8	22.0	39.5
65	28.8	38.9	1.2	4.0	24.0	39.8
66	77.6	82.7	3.5	5.2	0.5	0.8
67	50.3	108.6	0.7	4.8	29.0	49.1
68	45.7	248.2	1.0	5.4	33.0	56.8
69	16.7	34.7	0.1	0.3	0.5	0.8
70	8.6	21.6	0.1	0.3	0.5	0.8
71	10.2	45.4	0.4	0.5	8.0	10.0
72	22.7	34.7	0.1	0.3	0.5	0.8
73	4.9	12.8	0.1	0.3	0.5	0.8
74	84.6	94.5	0.1	0.3	0.5	0.8
Total	3443.6	4877.2	70.0	123.0	987.0	1483.0
Unit : Ha						

APPENDIX 9

1	604	687	411	583	1561	520	4090	4806	6071	779	2239	1514	201	307	773	4851	2310	2446	423	181	5037	1294	2051	2123	1554	3408	2824	1354	4842	6714	1367	3189	230	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	604	687	411	583	1561	520	4090	4806	6071	779	2239	1514	201	307	773	4851	2310	2446	423	181	5037	1294	2051	2123	1554	3408	2824	1354	4842	6714	1367	3189	230	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

PIZZERIO TABLE 2008 "ALL MOSES" IN 2010

Table with 30 columns and 30 rows of numerical data. The columns are numbered 1 to 30 at the bottom, and the rows are numbered 1 to 30 on the left. The data consists of integers ranging from 0 to 1000.

Table with 30 columns (1-30) and 30 rows (1-30). Each cell contains a numerical value. The values generally decrease from left to right and top to bottom. The last row (row 30) contains values that are significantly higher than the others, ranging from approximately 100 to 1000.

POPULATION TABLE THIS PURPOSE "TO BUSINESS" IN 2010

1	1204	72	10	11	237	63	476	225	165	16	28	29	32	33	34	35	36	37	38	39	707																			
2	172	324	5	5	63	14	98	61	46	6	16	10	37	11	39	46	18	9	5	5	0	4958																		
3	27	5	73	1	9	2	16	11	8	1	2	2	3	2	6	8	3	2	1	0	1344																			
4	4	30	5	1	74	17	3	20	13	9	1	5	2	9	7	8	19	3	2	1	0	245																		
5	216	29	2	6	554	30	202	84	73	6	15	17	101	46	107	26	40	14	10	2	0	2661																		
6	94	11	1	1	37	244	68	32	23	3	4	5	26	10	31	27	31	5	3	0	0	652																		
7	562	52	9	9	205	53	1070	224	143	14	23	24	147	68	178	381	64	28	18	2	0	4992																		
8	425	60	10	11	153	40	371	170	18	35	24	107	33	128	155	34	18	1	86	45	82	3832																		
9	239	45	7	9	120	29	259	178	75	16	24	19	34	27	96	118	54	28	20	2	0	3112																		
10	47	8	1	1	17	3	31	23	13	146	3	2	11	4	13	15	6	2	2	0	0	472																		
11	81	18	2	5	41	8	51	37	28	4	186	9	21	7	22	26	10	7	3	0	0	787																		
12	74	11	2	2	39	8	48	23	21	2	8	207	24	9	24	19	4	3	0	22	12	0	765																	
13	203	18	2	4	93	20	137	62	49	4	7	10	282	31	81	89	27	8	7	1	0	0	1763																	
14	148	11	1	1	74	14	35	44	22	2	6	8	54	310	83	48	20	5	5	1	0	0	1229																	
15	298	22	3	4	137	39	208	69	69	5	8	13	195	41	598	109	43	31	10	2	0	0	2610																	
16	337	41	6	8	163	38	239	169	125	11	21	21	158	46	164	575	76	32	15	2	0	0	2676																	
17	179	21	3	3	78	19	153	99	66	3	9	9	27	21	70	84	408	34	8	1	0	0	972																	
18	68	12	1	1	12	3	29	16	16	2	3	2	8	2	8	10	5	2	129	0	6	4	0	363																
19	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120																
20	210	36	5	8	108	20	144	95	72	9	26	23	72	27	73	81	31	17	9	1	0	0	0	2286																
21	246	18	2	3	110	22	161	87	55	4	5	11	85	28	91	80	34	8	8	1	0	0	0	2119																
22	244	33	4	7	124	25	133	162	80	8	18	18	95	24	99	103	40	17	10	2	0	0	0	2719																
23	288	22	4	5	158	25	251	113	90	7	11	18	129	52	148	129	54	15	13	2	0	0	0	3155																
24	280	20	3	4	69	15	105	64	49	5	11	11	53	17	56	62	23	12	5	1	0	0	0	3057																
25	292	21	4	5	128	26	202	108	86	7	13	16	88	38	189	118	48	18	11	2	0	0	0	4238																
26	472	40	6	7	197	45	325	160	128	10	17	22	154	61	172	195	75	24	17	3	0	0	0	5114																
27	775	48	7	7	318	70	519	218	242	11	13	30	246	111	263	274	117	27	28	5	0	0	0	2164																
28	179	24	4	5	75	17	139	98	71	7	18	11	68	17	68	107	137	26	7	0	0	0	0	430																
29	441	82	14	17	174	62	358	200	304	29	52	34	177	50	156	200	91	66	29	1	0	0	0	1370																
30	311	5	1	1	14	3	24	14	14	2	3	2	11	3	12	17	5	4	1	0	0	0	0	0	0															
31	90	16	2	4	44	8	62	47	33	4	11	9	30	9	31	37	15	9	4	0	0	0	0	0	0															
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
40	822	146	137	232	3713	955	6085	3709	2377	368	604	622	2687	1375	3134	3263	1572	784	426	65	2042	1588	2211	2709	1485	2475	3605	4761	3045	3264	365	960	14	0	294	122	125	144	0	70061

FOURTH QUARTER TRIP PURPOSE *ALL PURPOSE* 14 2010

Table with 35 columns (1-35) and 35 rows (1-35). Each cell contains a numerical value representing trip purpose data for a specific month and day.